CLAIMS

1. A method of testing an integrated circuit, comprising:

obtaining periodic optical emissions over a defined period of time and from a defined area of an integrated circuit operating with time-varying internal currents;

time-resolving said emissions by photon timing to estimate the number of switching events occurring in said defined area over said defined period;

providing an optical emission model; and

comparing the optical emission from the area of the integrated circuit with the optical emission model to determine whether any of a group of defined conditions are present in the integrated circuit.

2. A method according to Claim 1, wherein the group of defined conditions include local power supply loading under high power density operation, and changes in switching performance due to heating effects, and mid-cycle false switching, and effectiveness of switching control circuitry, and leakage control ciruitry.

3. A method according to Claim 1, wherein:

the obtaining step includes the step of applying a given set of instruction vectors to the integrated circuit to provide calibrated optical emissions; and

the time-resolving step includes the step of comparing said obtained optical emissions with said calibrated optical emissions.

4. A method according to Claim 1, further comprising the step of using the integrated circuit with a power distributing system having a given time constant, and wherein the time resolving step includes the step of time resolving said emissions at a resolution greater than said time constant.

5. A method according to Claim 1, wherein the integrated circuit has a thermal time constant, and the time resolving step includes the step of time resolving said emissions at a resolution greater than said thermal time constant.

6. A method according to Claim 1, wherein the defined area includes groups of switches, each of said groups having a unique signature emission waveform, and the comparing step includes the step of searching the optical emissions from the area for any of the signature emission waveforms of said groups.

7. A method according to Claim 6, wherein each of said groups of switches is comprised of a set of spatially unresolved individual gates.

8. A system for testing an integrated circuit, comprising:

means for obtaining periodic optical emissions over a defined period of time and from a defined area of an integrated circuit operating with time-varying internal currents;

means for time-resolving said emissions by photon timing to estimate the number of switching events occurring in said defined area over said defined period;

means for providing an optical emission model; and

means for comparing the optical emission from the area of the integrated circuit with the optical emission model to determine whether any of a group of defined conditions are present in the integrated circuit.

9. A system according to Claim 8, wherein the group of defined conditions include local power supply loading under high power density operation, and changes in switching performance due to heating effects, and mid-cycle false switching, and effectiveness of switching control circuitry, and leakage control ciruitry.

10. A system according to Claim 8, wherein:

the obtaining means includes means for applying a given set of instruction vectors to the integrated circuit to provide calibrated optical emissions; and

the time-resolving means includes means for comparing said obtained optical emissions with said calibrated optical emissions.

11. A system according to Claim 8, wherein the integrated circuit is used with a power distributing system having a given time constant, and wherein the time resolving means includes means for time resolving said emissions at a resolution greater than said time constant.

12. A system according to Claim 8, wherein the integrated circuit has a thermal time constant, and the time resolving means includes means for time resolving said emissions at a resolution greater than said thermal time constant.

13. A program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform method steps for testing an integrated circuit, said method steps comprising:

obtaining periodic optical emissions over a defined period of time and from a defined area of an integrated circuit operating with time-varying internal currents;

time-resolving said emissions by photon timing to estimate the number of switching events occurring in said defined area over said defined period;

providing an optical emission model; and

comparing the optical emission from the area of the integrated circuit with the optical emission model to determine whether any of a group of defined conditions are present in the integrated circuit.

14. A program storage device according to Claim 13, wherein the group of defined conditions include local power supply loading under high power density operation, and changes in switching performance mobility due to heating effects, and mid-cycle false switching.

15. A program storage device according to Claim 13, wherein:

the obtaining step includes the step of applying a given set of instruction vectors to the integrated circuit to provide calibrated optical emissions; and

the time-resolving step includes the step of comparing said obtained optical emissions with said calibrated optical emissions.

16. A program storage device according to Claim 13, further comprising the step of using the integrated circuit with a power distributing system having a given time constant, and wherein the time resolving step includes the step of time resolving said emissions at a resolution greater than said time constant.

17. A program storage device according to Claim 13, wherein the integrated circuit has a thermal time constant, and the time resolving step includes the step of time resolving said emissions at a resolution greater than said thermal time constant.